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NOTES ON SOME BOTANICAL INSTITUTIONS OF U.S.S.R.

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ABSTRACT

The paper gives a brief account of the botanical institutions in the following towns of U.S.S.R., visited by the author during April to October, 1969: Leningrad, Moscow, Batumi, Dushanbe, Kabuleti, Kiev, Novosibirsk, Tashkent, Tbilisi and Yalta.

INTRODUCTION

The author travelled and worked in the U.S.S.R. during April to October, 1969 under the auspices of Indo-Soviet Scientific and Cultural Exchange Programme. Prior to his departure, he tried to read something on botanical institutions of U.S.S.R., but it soon became clear that very little had been written on the subject in English. However, the author did come across the referenc of a recent book-*The Komarov Botanical Institute* by Shetler (1967); but could see it only after reaching Leningrad. M. A. Rau, who was a member of the first delegation of the Botanical Survey of India to U.S.S.R. in 1962, published two useful articles (*Rau* 1963, 1964).

Recently, several Indian scientists, teachers and students are going to U.S.S.R. under one or the other programme every year; thus articles about the organisation of the botanical institutions, and their research programmes should be helpful to them. No doubt, there are many publications of the Academy of Sciences of U.S.S.R., and of the Academies of different Republics on the history and activities of their institutions, but almost all of them are in Russian or in the local language of the Republics. Publications in English are few.

Rau's articles (*l.c.*) give a brief account of the gardens, herbaria and musea visited by him. Though a number of institutions visited by the present author were same as visited by the 1962 delegation, the information published by Rau is not repeated here. Also, several additional institutions and places were visited.

The author's interests being chiefly in taxonomy and economic botany, his work was generally confined to these departments; occasionally, however, observations were made also on other allied aspects. Regarding botanic gardens and herbaria, information is given on history, size, main sections or collections, and programmes of research. Specialisation of the research staff is indicated for some institutions. All information is based on author's own observations, and on discussions with directors or research workers. A few Russian scientists could understand and speak a little English, and the author a little Russian, but usually an interpreter was present. All interpreters were not familiar with botanical terms, and thus, there is a possibility of some errors in interpretation.

The spellings of personal names used here are same as adopted in *Flora of U.S.S.R.* (*Kirpicznikov* 1964); they are, in some cases, different from those used by Rau (*l.c.*).

The botanical institutions of Leningrad and Moscow are described first; other places are treated in alphabetical order.

LENINGRAD

Komarov Botanical Institute, Leningrad

The author worked for about 3 months in the herbarium, library, garden and museum of this Institute. Shetler's book (*l.c.*) gives a comprehensive account of this Institute, and very little can be added to that. The Institute has the following departments and laboratories:

Dept. of Vascular Plants (Taxonomy and Geography of Higher Plants ; Paleobotany ; Cytology ; Herbarium).

Dept. of Economic Plants or Plant Resources (Economic Botany ; Plant Chemistry ; Bio-Chemistry ; Technological Laboratory).

Dept. of Geobotany (Geobotany ; Vegetation of Northern Regions of U. S. S. R. ; Vegetation of Forest Zone ; Biogeocoenology ; Vegetation of Arid Regions ; Cartography ; Cytoecology and Cytophysiology).

Dept. of Cryptogamic Plants (Algology ; Mycology ; Lichenology and Bryology).

Dept. of Morphology (Embryology ; Anatomy and Morphology).

Botanic Garden.

Botanical Museum.

Laboratories of Photosynthesis and Microelements.

The herbarium of this Institute is one of those few herbaria outside India, which abound in Indian material. The study of several genera of grasses showed that a good number of Indian species are represented. A large number of Wallichian sheets are also present. The type specimens are kept separately, but a number of them still seem to be mixed in the General Herbarium. The author isolated several type specimens pertaining to Indian plants. Among the significant collections in this herbarium, one is that of Academician K. B. Trinius, the famous agrostologist of the 19th century. Many Indian species owe their discovery to Trinius, and the types of some such species are available only in Leningrad.

Proper division of work among scientists of the taxonomy department has greatly facilitated specialisation. For example, the author gathered the impression that the evolution of International Rules of Botanical Nomenclature is the concern of practically only one scientist in the whole Institute; this is I.A. Linczevski. He has translated the 1959 Code into Russian. The record of name-changes in plants is the concern of S. K. Czerepanov. Few other scientists seemed to devote much time to these subjects; they referred their queries to these two scientists. M. Kirpicznikov has specialised in certain other fundamental studies. He is a co-author of (*i*) a Latin-Russian Botanical Glossary, and (*ii*) a book dealing with standardisation of abbreviations, names of places and symbols. Kirpicznikov is also a co-author* of a series of volumes on descriptive external morphology. Vol. 1 has a detailed illustrated account of leaf and its modifications; Vol. 2 deals with shoot, culm, tuberous stems and root. Vol. 3 will deal with flower and inflorescence; and Vol. 4 with fruit and infructescence.

The special interests of scientists in the Herbarium and Laboratory of Higher Plants are indicated below:

I. T. Vassilczenko (History of botany, Cucurbitaceae, Vitaceae, *Medicago* L., *Trigonella* L.).

E. G. Bobrov (History of flora, Betulaceae, Capparidaceae, Cistaceae, Dipsacaceae, Geraniaceae, Tamaricaceae, *Eryngium* L.).

A. A. Fedorov (Tropics and Caucasus, Campanulaceae, Primulaceae).

I. A. Grudzinskaja (Far-East, Urticaceae).

A. I. Pojarkova (Caprifoliaceae, Solanaceae, Rosaceae, Araliaceae).

I. A. Linczevski (Anacardiaceae, Rutaceae, Plumbaginaceae).

N. N. Tzvelev (Poaceae, Theories of evolution, *Cleome* L.).

S. K. Czerepanov (*Alnus* L., *Centaurea* L.).

V. P. Botschantzev (Flora of deserts and Algiers, *Salsola* L.).

V. I. Grubov (Mongolia, Tertiary flora of Kazakhstan, *Rhamnus* L.).

M. Kirpicznikov (Compositae).

L. I. Ivanina (Scrophulariaceae, Gesneriaceae, *Digitalis* L.).

A. E. Bobrov (Pteridophytes).

J. L. Menintzki (*Quercus* L., *Thymus* L.).

T. I. Zaikonnikova (*Deutzia* Thunb.).

T. I. Leonova (Celastraceae).

O. V. Tzerneva (Labiatae, *Cousinia* Cass.).

A. G. Borissova (Leguminosae, *Veronica* L.).

E. G. Pobedimova (Rubiaceae, Asclepiadaceae, Apocynaceae).

Some of these scientists are also in-charge of different sectors of the herbarium.

The 30-volume Flora of U.S.S.R., prepared in this Institute was completed in the year 1964. Some senior workers feel that since (*i*) the first volume is now over 40 years old, (*ii*) the earlier volumes were not as satisfactory as the more recent ones, and (*iii*) many volumes have also gone out of stock, time is ripe for initiating revision of the Flora. Some specialists seem to be already working on the revised drafts of the earlier few volumes.

The library of the Komarov Institute has good arrangement for documentation. An up-to-date record of receipt of periodicals is indexed. All taxonomic literature is indexed subject- and author-wise. The author catalogue has two sections—one for literature in Russian, and the second for other languages. In all, there are about one and a half million index cards.

The Department of Economic Botany (Plant Resources) has four laboratories. The Botany laboratory includes work on Plant Anatomy, Pharmacognosy, Phytosociology, and even Agronomy. This department has been studying plants yielding vitamins, edible coloring substances, tannins, gums, dyes and oils, etc. Al. A. Fedorov, Chief of this Department (and Director of the Institute) informed me that the use of synthetic dyes for food stuffs and drinks is forbidden in U.S.S.R. The synthetic yellow color is believed to cause cancer; synthetic dyes are also unsuitable for woolen carpets. So, the search for new and suitable vegetable dyes continued. Fedorov has also specialized in Mimosaceae.

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*With Al. A. Fedorov and Z. T. Artuschenco.

The genus *Glycyrrhiza* L. is considered a suitable source of certain hormones ; *Cyamopsis* DC. is being studied for gums. *Heracleum* L. has been found suitable for fodder. Certain members of Umbelliferae, Rutaceae, Compositae and Leguminosae possess a substance which retards division of cells; these are being studied for treatment of cancer.

The Botanic Garden of Komarov Institute is comparatively small, but its glass-houses and the collections maintained therein, are unique. The large palm conservatory is 26 m high. Many tropical plants carried from India by N. A. Avrorin (Chief of Garden) in 1961, could be seen in the Tropical section. These include species of *Ficus* L., *Dillenia* L., *Peltophorum* Walp. and *Lantana* L.

The Botanical Museum is housed in a separate new building; it performs three main functions: Education, Technical Information and Research in Phytogeography. Its Curator F. Kh. Bakhteev is a specialist on *Hordeum* L.; he worked with late Academician N. I. Vavilov. An illustrated account of the Museum and several other publications have been issued from the Museum.

Botany Department, Leningrad University

This department has a herbarium of about 2,00,000 specimens. Its Chief, A. I. Tolmatchew told us that among the projects now in hand, one is on the Medicinal Flora of U.S.S.R. It is a 5-year project, and will deal with about 1500 species. Notes on the distribution of medicinal plants are being collected from actual specimens in different herbaria of U.S.S.R. Several institutes and individuals are collaborating in this work, and five scientists are working exclusively for it, touring, collecting and editing the information. An Atlas of Medicinal Plants (having illustrations) is also under preparation.

Vavilov Institute of Plant Industry, Leningrad

Whereas the Komarov Institute is concerned with naturally growing plants, the Vavilov Institute confines itself to work on cultivated plants. The cereals, vegetables, fruits, leguminous plants and technical plants are being studied in different sections. The herbarium of the Institute has about 1,40,000 specimens belonging to 182 families, 1220 genera and 4600 species. Academician D. D. Breznev is the Director of the Institute.

MOSCOW

Main Botanic Garden, Moscow

This garden has been named as the chief botanic garden of U.S.S.R. The All Union Council of Botanic Gardens of U.S.S.R., which organises the development of botanic gardens in the whole country, is located here. Its Director, Academician N. Tsitsin, is well known for his work on *Triticum* L. and allied genera, in search of a perennial wheat. He has published detailed accounts of the plants introduced in the Garden, including an account of the Roses with numerous color pictures.

The public relations activities of the Garden deserve a special mention. The Garden employs 8 guides for conducting 'excursions', for taking the visitors round the gardens and glass-houses. This system of employing trained guides for excursions was started by late Academician V. L. Komarov about the year 1918, and now exists in all botanic gardens in U.S.S.R. The guides are usually botany or agriculture graduates, and are familiar with plants of the garden. One guide conducts 1 or 2 excursions per day, (duration 1 hour; 1½ hours for children); and there are 5 or 6 excursions each day. The guides also do some other technical work; several of them do research in horticulture. Many school students spend their periods of nature-study and gardening actually working in the gardens.

The lay-out of the Glass-houses is such that certain experimental or special sections can be kept out of routine excursions.

The Flora Section is divided by regions, such as, Central Asian, Middle Asian, Caucasus, Far-East, and Siberia, each under the charge of some scientists. The complete record of introduction work in a sector is the responsibility of this scientist. Many scientists are working for their doctoral theses on problems of plant introduction. The Garden has rich variety, and the 1968 'Delectus Seminum' (seeds for exchange) comprises 1379 items.

The herbarium of this Garden was established about 15 years ago, and now has 80,000 specimens representing 14-15 thousand species of U.S.S.R., and 3-4 thousand foreign species. Rau (*l.c.*) had reported only 8000 specimens in the herbarium in 1962; in a short period of 7 years the number has increased 10 times. Some specimens collected by Russian botanists in India in 1961 are lodged in this herbarium. A. K. Skvortsov is part-time Curator; he is engaged on Salicaceae, Betulaceae and *Rosa* L. The special interests of other workers are: V. N. Voroschilov—*Aconitum* L., *Valeriana* L., *Polygonum* L.; E. J. Gogina—*Thymus* L. and G. M. Proskuriakova—*Ranunculus* L.

The library of the Garden is young but well-organised. The staff is engaged on certain bibliographies; the one on Photoperiodism (1940-1963) is already published. Three more bibliographies on (*i*) Plant Introduction and Acclimatisation, (*ii*) Hybridisation and (*iii*) Afforestation or 'Green-belts' are under preparation. There are Assistants knowing different languages, including Hindi.

Botany Department, Moscow University, Moscow

This herbarium has about 6,00,000 specimens, mostly of Russian plants. Only about 6000 specimens are foreign. The type specimens are not kept separate. N. V. Pavlov is Curator. P. A. Smirnov, a very senior scientist, is specialist on grasses. Out of about 60 species of the genus *Stipa* L. occurring in U.S.S.R. about 20 were discovered by Smirnov.

All Union Scientific Research Institute of Medicinal and Aromatic Plants, Vilar, Moscow

This Institute is situated in a forest park about 22 km from Moscow, and is the main centre of Russian research on medicinal plants. Its Director V. G. Chrshanovski had been to India, and seems to have carried back fond memories of his stay. It was no small pleasure to spot a white Gandhi cap in a restaurant in Yalta one day (8.7.69), and to discover that the person under the cap was Chrshanovski.

The work of the Vilar Institute is divided into 4 sections: (*i*) Plant Growing; (*ii*) Chemistry; (*iii*) Medico-biology and (*iv*) Scientific Organisation. The functions of the Plant Growing section include collection, introduction, cultivation, agrotechnique, mechanisation, agrochemistry and physiology, selection, plant protection, steroid plants and pharmacognosy. Botanists pass on suspected new medicinal plants to chemists. There are about 20 large State Farms (3-4 thousand hectares each) in U.S.S.R. for raising useful plants; medicinal plants take about 30 per cent of this area.

The collection of medicinal plants is done also through the collective farms and cooperative shops. The cooperative shops selling consumer goods in country-side procure medicinal herbs from local people. For maintaining authenticity of material, each shop is authorised to collect only selected 4 or 5 common species of that locality. The demand of the crude drugs is so much that certain centres have been set up only for purchasing medicinal plants. The crude drugs are dried in sun, or artificially.

In all, about 160 plant species are reported to be exploited commercially. Out of a total of about 19,000 phanerogams in U.S.S.R., 5000 have been chemically screened; and about 400 have shown presence of active principles. The local folk-lore, however, claims about 3000 species to be medicinal. A brochure issued by the Ministry of Public Health says that the Vilar scientists have released 60 new drugs for treatment of various diseases. The total staff engaged at the main Institute and its 10 sub-stations is about 1000 persons.

The botanic garden of Vilar (area 45 ha) has about 10,000 species. The garden has 3 sections: First, called the Flora Garden, has a large number of species, each represented by a few plants. This serves as a demonstration garden and a living museum merely for variety. The second has large beds and supplies material for chemical tests. The third has fields for large-scale cultivation.

The herbarium has about 80,000 specimens belonging to 10,000 species; it has some specimens from India also.

Author's enquiries about folk-medicine and ethnobotany did not bring forth much information; perhaps very little by way of folk-medicine now exists in paractice. Some botanists and pharmacologists have, however, collected ample notes on botanical folk-lore; mention could be made of Dr. Hammerman, I. T. Baechmann, I. A. Muravjev, Y. N. Ivanovna and A. I. Schroter.

BATUMI

The Botanic Garden at Batumi is situated on slopes of hills overlooking the Black Sea. Director A. N. Krasnov told us that the Garden is divided into geographical Sectors, like Caucasus, East Asia, Himalayas, Australia, New Zealand, South America, Mediterranean region and Adjaria; having in all about 5000 species. An account of the nonherbaceous species (*c.* 2000), showing their native home, history of introduction, etc. has been published.

Batumi is an important region for cultivation of tea, and one sees numerous tea gardens on the lower hill slopes. A complex of research institutes and factories devoted to development of tea is located in this region.

We visited the Mtirala mountain (alt. *c.* 1000 m) about 21 km from Batumi; here the rainfall is reported to be 4000 mm, the highest in U.S.S.R. From the top of the hill one gets a lovely view of the Black-Sea-Coast and the Batumi harbour.

DUSHANBE

The Botanical Institute is situated within the Botanic Garden; these two institutions are being directed by a husband-wife team of Academician P. N. Ovczinnikov and Mrs. Ovczinnikov.

The Garden (area 26 ha, estd. 1933) has about 2200 nonherbaceous species. The Garden includes 5 Sectors: (*i*) Europe, Siberia and Mediterranean; (*ii*) Eastern Asian; (*iii*) Middle Asian; (*iv*) North African and (*v*) American. The new glass-house under construction will be 29 m high, and hence, so far, the highest in U.S.S.R.

The Botanical Institute has many departments and sections, such as Geobotany, Ecology, Plant Resources, Chemistry of Plants, Lower Plants. The Section of Geobotany is preparing vegetation maps. The herbarium has about 1,00,000 specimens. The Flora of Tadzhikistan is under preparation, and 3 volumes are already published. This Republic has a flora of about 5000 species; almost all are represented in the herbarium. Author's study of some genera of Poaceae showed that many types are present, but have not been isolated or labelled so. Ovczinnikov has done much work on grasses; his other interests are the genera *Androsace* L., *Ranunculus* L., *Silene* L. and *Piptanthus* Sweet. M. Rasulova is working on Leguminosae, and A. P. Czukavina on Boraginaceae, Plumbaginaceae and Polygonaceae.

The Institute has several sub-stations; they work on local problems, and supply information to the main Institute. One sub-station is at Varzob (in Kondara forests of Pamir Hills), 30 km north of Dushanbe. It has a herbarium, a library, and a small well-kept museum of economic products. The natural occurrence in these forests of *Ostrowskia magnifica* Regel (a remnant of the tertiary period), and cultivation of grape vine are of interest.

The programme of afforestation of some barren hills around Dushanbe town includes plantations of *Prunus divaricata* Ledeb., *Pistacia vera* L., *Juglans regia* L. and *Malus* spp.

KABULETI

There is a Medicinal Plant Farm and Laboratory at Kabuleti about 30 km from Batumi. Its Garden has about 400 medicinal species; but the Farm is devoted chiefly to cultivation of *Aloe* L., *Orthosiphon* Benth., *Passiflora* L., *Stephania* Lour. and *Nerium* L. The Farm has 32 glass-houses, with a floor area of about 2 ha; about 5000 plants of *Aloe* can be raised in one glass-house. The Farm also imparts training in cultivation of medicinal plants.

KIEV

Botanic Garden, Kiev

This Garden was first established in 1936 on an area of about 40 ha; but during German war and occupation, it was destroyed. Its restoration was taken up in 1944; it now occupies about 200 ha. In addition to the various geographical sectors and some special collections, 4 sections are devoted for economic plants, namely, food, medicine, fruits and ornamentals. The Garden has about 10,000 species and varieties. Director T. A. Mukhailabour told us that the Garden has 11 departments, namely: (*i*) Seed Science; (*ii*) Natural Flora; (*iii*) Cultivated Flora; (*iv*) Dendrology and Landscape; (*v*) Ecology and Physiology; (*vi*) Ornamental Plants and Greenhouses; (*vii*) Plant Protection; (*viii*) Introduction; (*ix*) Planning or Landscape of Gardens; (*x*) Sub-stations and (*xi*) Scientific Information, Library and Exhibitions. The entry-fee* for the Garden is 10 kopecs+ (children 5 k; retired persons, invalids and students free).

The herbarium has about 1,00,000 specimens (*c.* 10,000 spp.), N. M. Dudik is working on a seed-atlas of the Leguminosae. S. S. Charkevicz is working on Ericaceae, Ranunculaceae and *Polygonum* L. N. R. Kachno is working on Aceraceae. *Crambe cordifolia* Steven. (Crucierae), a large-leaved perennial, is reported to have 12-14% protein, and an yield of *c.* 100 tonnes of green mass/ha. It is being studied for use as fodder.

Botanical Institute, Kiev

Started in 1931 as a small laboratory and herbarium, this Institute now has 14 departments, namely, (*i*) Systematics; (*ii*) Geobotany; (*iii*) Physiology; (*iv*) History of Flora; (*v*) Algology; (*vi*) Other Lower Plants; (*vii*) Cytology and Embryology; (*viii*) Biochemistry; (*ix*) Biogeocoenology; (*x*) Morphology; (*xi*) Botanical Museum; (*xii*) Structure and Function of Cell; (*xiii*) Plant Protection and (*xiv*) Experimental Stations.

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*Several botanic gardens in U.S.S.R. charge an entry fee.

+k: kopec; 2 kopecs = 17 paise.

The herbarium of the Institute has *c.* 10,00,000 specimens, and is one of the main herbaria of U.S.S.R. A. I. Barbaricz is the Curator. There are some old special collections, such as the herbaria of N. S. Turczaninow, I. F. Schmalhausen, A. S. Rogowicz, W. S. J. G. Besser and J. E. Gilibert. Turczaninow herbarium comprises about 52,000 specimens and is very rich in Indian material.* The Schmalhausen herbarium has about 30,000 sheets, kept in large card-board ledgers. About 100 ledgers with Roman numbers contain personal collections of Schmalhausen; 173 ledgers with Arabic numbers contain Schmalhausen's collections, but belong to the University of Kiev. Rogowicz hervarium has 95 ledgers. The Lichen herbarium has *c.* 50,000 specimens (*c.* 2000 species). The Director of the Institute O. A. Nikolai is a Lichenologist.

NOVOSIBIRSK

Novosibirsk is situated at 55.20 N and 83.42 E in Siberia. About 10 years ago, the Academy of Sciences established a new town called 'Akademgorod' (*Gorod*: town), about 35 km from Novosibirsk. This centre of scientific training and research is the brainchild of an Academician who realised that despite its vast natural resources, the Republic of Siberia was relatively backward. He emphasised that research on the natural resources must be done there on the spot, and that scientific research, technology and training should all be at one place. The Academy-Town, therefore, has only research institutes (20 in all); the Botanic Garden is one of these Institutes.

Botanic Garden, Academy-Town, Novosibirsk

The Garden, established in 1964 in a Birch and Poplar forest**, has an area of 1600 ha; it is believed to be the biggest botanic garden in U.S.S.R. Director K. A. Sobolevskaja explained us the future plan and the sections that would eventually develop. Its 3 sections, namely, (*i*) Useful Plants; (*ii*) Flora Siberica and (*iii*) Systematics Section have already been developed. The Useful Plants Section has species yielding medicines, fibres, oils, forage and tannins. Y. N. Ivanovna is in-charge of medicinal plants section; she has also done work on ethnobotany. Sobolevskaja is an author or editor of numerous publications, including several illustrated accounts of the plant introduction work.

The Garden has *c.* 7000 species and varieties. The Garden has the status of a research institute; it has laboratories of (*i*) Flora; (*ii*) Plant Resources; (*iii*) Ornamentals; (*iv*) Introduction and Acclimatisation; (*v*) Forestry; (*vi*) Physiology and Biochemistry; (*vii*) Microbiology; (*viii*) Geobotany and (*ix*) Herbarium Taxonomy. Some laboratories are situated in the main town of Novosibirsk.

The herbarium has *c.* 60,000 specimens; it has 4 sections, namely (*i*) U.S.S.R.; (*ii*) Siberia; (*iii*) Plant Introduction Work and (*iv*) Exchange Section. Its Curator I. M. Krasnoborov has worked on *Asplenium* L. and *Anoplocaryum* Ledeb. A. I. Yakubova has worked on the genus *Patrinia* Juss. A. V. Kuminova of Geobotany Department has published many works on geobotany of Altai Mts.

One of the main aims of the Garden is to introduce or evolve food and other plants suitable for the conditions in Siberia.

Institute of Cytology and Genetics, Academy-Town, Novosibirsk

There is a separate Institute for researches on cytology and genetics (of plants as well as animals). Asst. Director G. F. Priyalov showed his experiments on induced mutations in species of *Pinus* L., *Ribes* L. and *Acer* L., etc.

TASHKENT

Botanic Garden, Tashkent

The main aim of this Garden (area *c.* 80 ha) is plant introduction. The Garden has *c.* 7000 species of phanerogams; of these about 2000 are non-herbaceous. Director F. N. Rusanov has published monographic accounts of *Hibiscus* L. and *Tamarix* L.; and is now working on *Yucca* L. and roses. The Garden has a staff of *c.* 200, including 20 Doctors and 30 scientific assistants.

The Medicinal Plants Section has *c.* 500 species; some new plants have been studied here and put into commercial use. *Apocynum androsaemifolium* L., an American plant yielding the alkaloid 'Strafantinca' (useful for cardiac ailments), has been success-

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*A detailed account of this herbarium is given elsewhere (*Jain*, 1971).

**It is noteworthy that several botanic gardens in U.S.S.R. are established in natural forests. Some forest area in a plain land or even on one or more ranges of hills is assigned to a botanic garden. Small portions of the forest are then converted into phytogeographic sectors or formal gardens of different types. But for knowing this background, one would be startled to hear of a botanic garden of 1600 hectares.

fully grown on large scale. Rusanov has been to India and told us that Russian apples, melons and grapes should do better than the varieties now grown in India.

A new laboratory building is under construction. Some specialists in the Garden are: A. U. Usmanov (Plant Introduction and Dendrology); Z. P. Botschantzeva (Tulips and Plant Morphology); T. E. Slavkina (Dendrology); K. Chadjaev (Medicinal Plants, *Dioscorea*).

The Herbarium of Botany Department, Tashkent University

This Herbarium was established in 1908 at Moscow as a collection of Middle Asian plants; in 1932 it was brought and merged with Tashkent University. Its Curator A. I. Vvedensky is an Agrostologist, and is author of Vol. I of Flora of Middle Asia. The herbarium has *c.* 800 type specimens. Due to paucity of staff, the herbarium is unable to entertain exchange of specimens.

Botanical Institute, Tashkent

This Institute has 5 departments and 16 laboratories. Academician Sayeedov, Chief of the Anatomy and Morphology Dept., is the Director. The Plant Resources Dept. studies plants yielding tannins, dyes, saponins and medicines; it has Laboratories of Botany, Chemistry and Biology. Some ethnobotanical work is also being done here. This Department has recommended certain species (like, *Polygonum coriarium* Grig. and *Rumex tianchanicum* Los.) as suitable for leather industry. Some other specialists of this Institute are: P. K. Zageerov (Geobotany); R. Khudaiberdyev (Paleobotany); I. Momotov and G. J. Golarschenko (Desert Stations); W. A. Burigin (Ecology); M. M. Nabiev (Systematics) and S. S. Sachorov (Plant Resources). The Institute has a large solar reflector. Uzbekistan has a large population of sheep, and 70% of its land is arid. Work is, therefore, being done on desert reclammation and on fodder-yielding plants. *Kochia prostrata* Schrad. has given good results, and is now grown on an area of *c.* 30,000 ha. The laboratories of Ecology, Plant Physiology and Agronomy, are all collaborating in this work. For purposes of desert reclammation, the indigenous species are proving more suitable than exotic ones.

The Flora of Uzbekistan is being prepared in this Institute in collaboration with the herbarium of the University; six volumes of the Flora are already published.

TBILISI

Botanic Garden, Tbilisi

The Garden is situated on hill slopes. About 80 ha area is under cultivation, and same under natural vegetation. Director M. A. Gogolishvili told us that the work of the Garden is divided into 3 Departments, (*i*) Introduction and Selection; (*ii*) Ornamental Section and Floriculture and (*iii*) Parks and Landscape Gardening. Ornamental plants belonging to the genera *Paeonia* L., *Rosa* L., *Iris* L., *Primula* L., *Tulipa* L., *Hyacinthus* L., *Mesembryanthemum* L. are being studied. This work has led to the introduction of *c.* 380 species and varieties into ornamental cultivation. *Cedrus deodara* Loud., an exotic, is now largely grown for ornament, afforestation, and even timber. Species of *Pinus* L. and *Picea* Link have also been found suitable for afforestation. The Garden has sub-stations at Kojori, Tsavkisi and Krtsanisi.

Botanical Institute, Tbilisi

This Institute has 7 Departments, namely, (*i*) Systematics and Geography; (*ii*) Geobotany; (*iii*) Cultivated Plants; (*iv*) Anatomy and Physiology; (*v*) Lower Plants; (*vi*) Microbiology and (*vii*) Applied Botany. The Geobotany Department has Laboratories of: (*a*) Experimental Ecology, (*b*) Spore and Pollen Analysis, (*c*) Field Studies and Forest Phytocoenology. N. N. Kezkovelly is Director of the Institute. Charadze Sachokia, Chief of Systematics and Geography told us that the herbarium was founded in 1894 as a part of the local Botanic Garden; in 1934, when this Institute was founded, the herbarium was shifted here. The herbarium now has *c.* 7,00,000 specimens; there is one General Herbarium and some special Sectors, such as for Iran, Turkestan, Middle Asia, and also India.

Charadze Sachokia is working on *Campanula* L., and Caryophyllaceae; her senior colleagues are I. P. Mandenova (Umbelliferae, *Rosa* L.), O. A. Kapeller (*Stachys* L.), Kuthatheladze, and L. M. Kemularia-Nathadze.

The publications of this Department include a Flora of Georgia (in Georgian language), a book on the Ranales, a number of floristic lists and some glossaries, etc.

The Institute has its sub-stations at Bakuriani (alt. 1800 m) and Kazbek (alt. 2000 m) for study of high mountain regions, at Ositin in southern region, and at Shirak in eastern region.

M. F. Sachokia, Chief of Geobotany Department, fondly remembers his visit to India in 1961; he is now working on *Rhamnus* L.

Herbarium of Natural History Museum, Tbilisi

This herbarium also has many type specimens; some are even relevant to Indian species. The types are, however, still mixed in the general herbarium, and are not kept separate.

YALTA

Nikita Botanic Garden, Yalta

This Garden (area *c.* 275 ha) is a joint botanical institute and garden, and is situated in very beautiful settings on the coast of Black Sea. The Garden employs about 90 scientists, 180 technical staff and 700 gardeners and workers. It also has some sub-stations; their total area is about 800 ha.

The 3-volume Flora of Crimea, dealing with *c.* 2300 species, was completed here in 1962. In the revised version of this Flora, it is proposed to group plants by their usage, such as, wild-growing fruit plants, oil-yielding plants, and so on. 'Wild-growing Fruit Plants of Crimea' by B. M. Kosykh is already published.

The vegetation of Crimea shows four distinct altitudinal zones. We visited Mt. Red Stone (alt. 1300 m) about 16 km from Yalta, and there on top we saw the 'Jalao' type of vegetation, comprising bushes of *Pinus sylvestris* L. subsp. *hamata*, and the Steppe formed of several grasses (such as, species of *Bromus* L., *Festuca* L., *Poa* L., *Brachypodium* P. Beauv.). The zone between 800 and 1200 m comprises *Pinus sylvestris* L., *Carpinus betulus* L., *Fraxinus excelsior* L., *Fagus orientalis* Lipsky and *Tilia* sp. Further down, the zone at about 300-800 m comprises *Pinus pallasiana* Lamb. and *Populus tremula* L., etc. *Atropa belladona* L. is quite common here, and is exploited for medicine. The lowest zone, which merges with the sea-coast comprises chiefly species of *Juniperus* L. and *Quercus* L. The vegetation of the lower zones can be seen even in the Garden.

The Economic and Technical Plants Section of the Garden is concerned chiefly with oil-bearing, ether-bearing and drug plants, such as Roses, Lavender and *Syringa*, etc. The Economic Plants Garden comprises terraces of seed-beds, low glass-topped nursery beds, and small and large experimental plots.

To sum up, some noteworthy features of the botanical institutions of U.S.S.R., visited by the author, are:

(*i*) Development of some botanic gardens in or around natural forests.

(*ii*) Identification of the problems, and orientation of research according to the needs of a particular region.

(*iii*) Priority for introduction of new useful plants.

(*iv*) Emphasis on intensive work and specialisation.

(*v*) Intensive documentation and bibliographic work in botanical libraries.

(*vi*) Active participation in botanical teaching, and education of public.

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A stay of as-long-a-period-as six months in a country, where a different language is spoken, can not be profitable and reasonably comfortable without the help and cooperation of a large number of people in the laboratories, hotels, streets and shops, etc.; they are too many to be mentioned here; the author is greateful to them all.

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